# THE WEATHER AND CIRCULATION OF MARCH 1953[1]—

## Including a Review of This Year's Mild Winter

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### THE WINTER SEASON

The three winter months from December 1952 through February 1953 comprised the second warmest winter on record for the United States as a whole. The nation's "weighted temperature average," an index computed from State-wide mean temperatures weighted according to the areas of each State, was 36.7° F., 3.1° above normal for the 60-year period of record (beginning 1893). Table 1 shows that the mildest month of the winter was January [1] which was also the warmest January on record, while the coldest weather of the winter occurred during December [2]. Only during the winter of 1933–34 was the United States weighted temperature average higher than it was this winter. In the 1933–34 winter, however, temperatures averaged below normal (by as much as 8°) in the Northeast. This winter, on the other hand, practically all parts of the country enjoyed above normal temperatures, as illustrated in figure 1. Greatest positive anomalies occurred in the Northern Plains and Northern Rocky Mountain States (+8°) and in the Northeast (+6°), while temperatures averaged near normal in the Southeast.

TABLE 1.—*United States weighted temperature averages (°F.)*

| | December 1952 | January 1953 | February 1953 | Winter 1952–53 |
|---|---|---|---|---|
| Temperature | 34.9 | 37.9 | 37.3 | 36.7 |
| Departure from 60-year average | +0.6 | +5.8 | +2.8 | +3.1 |

The circulation responsible for this winter's mild weather is illustrated in figure 2, which is the mean 700-mb. map for the three months from December 1952 through February 1953. The most important feature of this chart is the abnormally strong west-southwesterly flow indicated throughout the eastern half of the Pacific, between a deeper than normal Aleutian Low, displaced to the southeast of its normal position, and an abnormally strong Eastern Pacific High northeast of its normal location. Wind speeds along the axis of this flow, averaged over the entire winter season, were as high as 50 m. p. h. at the 700-mb. level (fig. 3a), and as great as 15 m. p. h. in excess of normal speed (fig. 3b). As a result of this strong "jet stream" in the Pacific and its extension eastward through Washington, Montana, and the Dakotas, vast quantities of mild maritime air were carried in repeated surges from the relatively warm waters of the ocean into most of the United States. The effect of this Pacific air was particularly marked in the western part of the country where abnormal warmth was accompanied by ridge conditions and above normal heights at 700 mb.

In the eastern United States an additional factor contributed to the abnormal warmth. This was the presence of a strong blocking-type ridge in the North Atlantic, where average heights for the season were as much as 330 ft. above normal (fig. 2). Because of this "block" wind speeds in the westerly jet stream normally found at middle latitudes of eastern North America and the western Atlantic were considerably weaker than usual this winter (fig. 3). The anomalous circulation around the blocking ridge, indicated by the dashed lines of figure 2, produced southeasterly winds, relative to normal, throughout the eastern United States. This means that onshore flow of maritime Atlantic air was more frequent and more intense than usual. Since the ocean is normally warmer than the land in winter, the strengthened easterly winds produced above normal temperatures throughout the East (except for the extreme Southeast).

A third significant feature of the seasonal mean 700-mb. circulation was the prevalence of southerly wind components, relative to normal, in practically all of Canada,

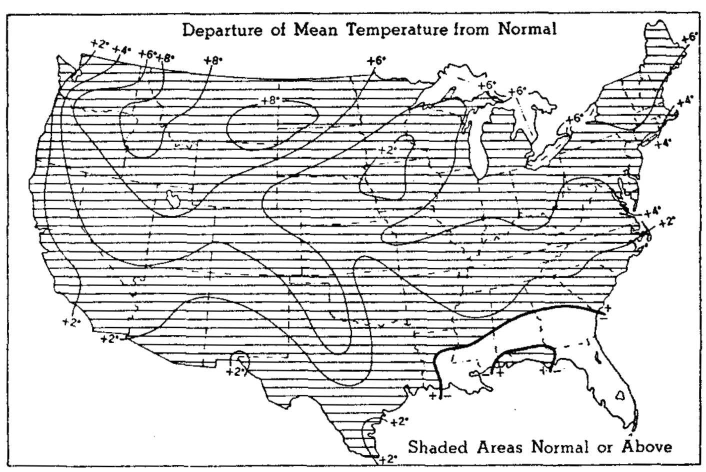



FIGURE 1.—Mean surface temperature anomaly for winter of 1952–52 (Dec.–Feb.). Note above normal temperatures in all parts of the country except the extreme Southeast.

[1] See Charts I–XV following p. 89 for analyzed climatological data for the month.

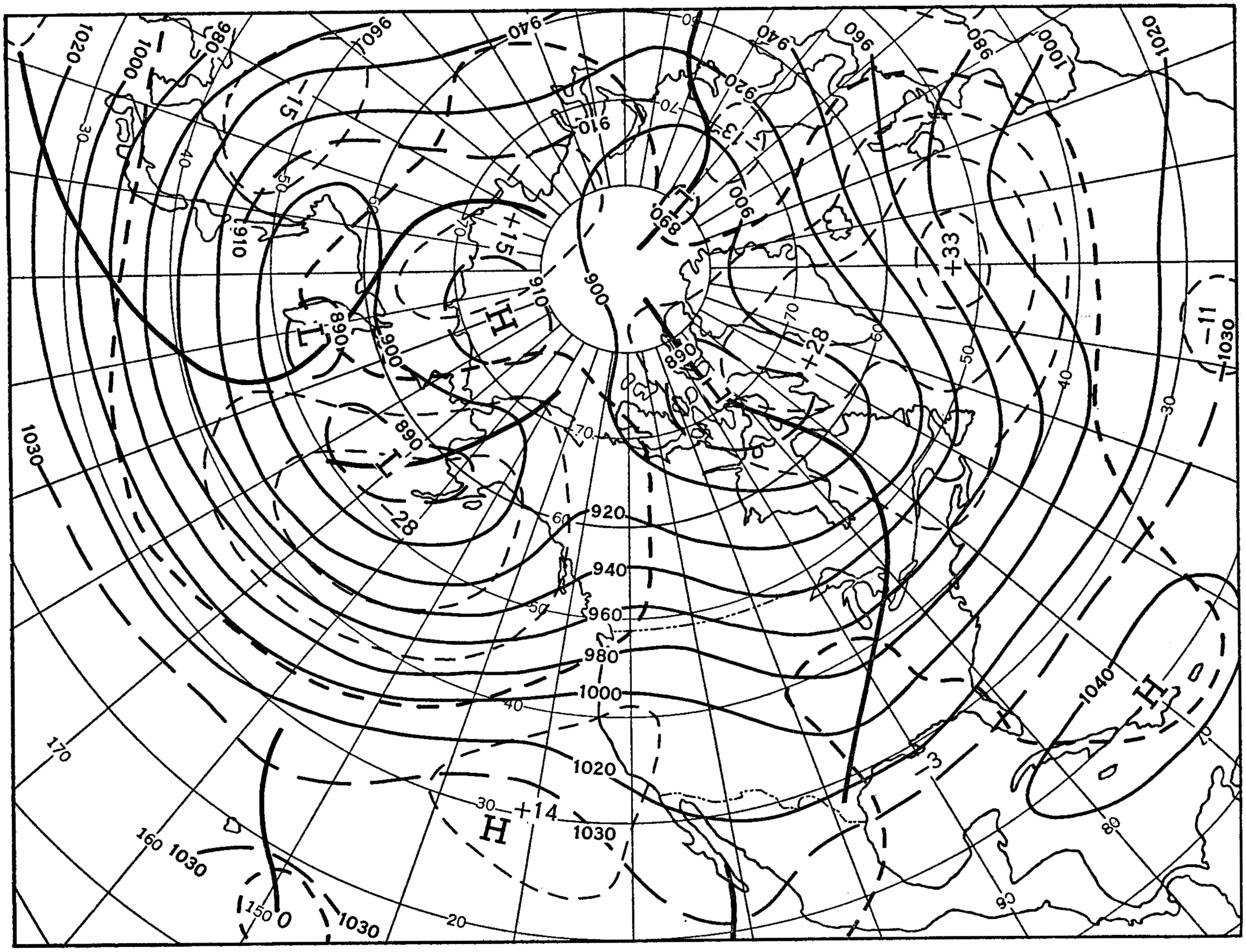



FIGURE 2.—Mean 700-mb. height contours and departures from normal (both in tens of feet) for winter of 1952–53 (Dec.–Feb.). Note anomalous flow of warm maritime air from both the Atlantic and the Pacific into the United States and Canada.

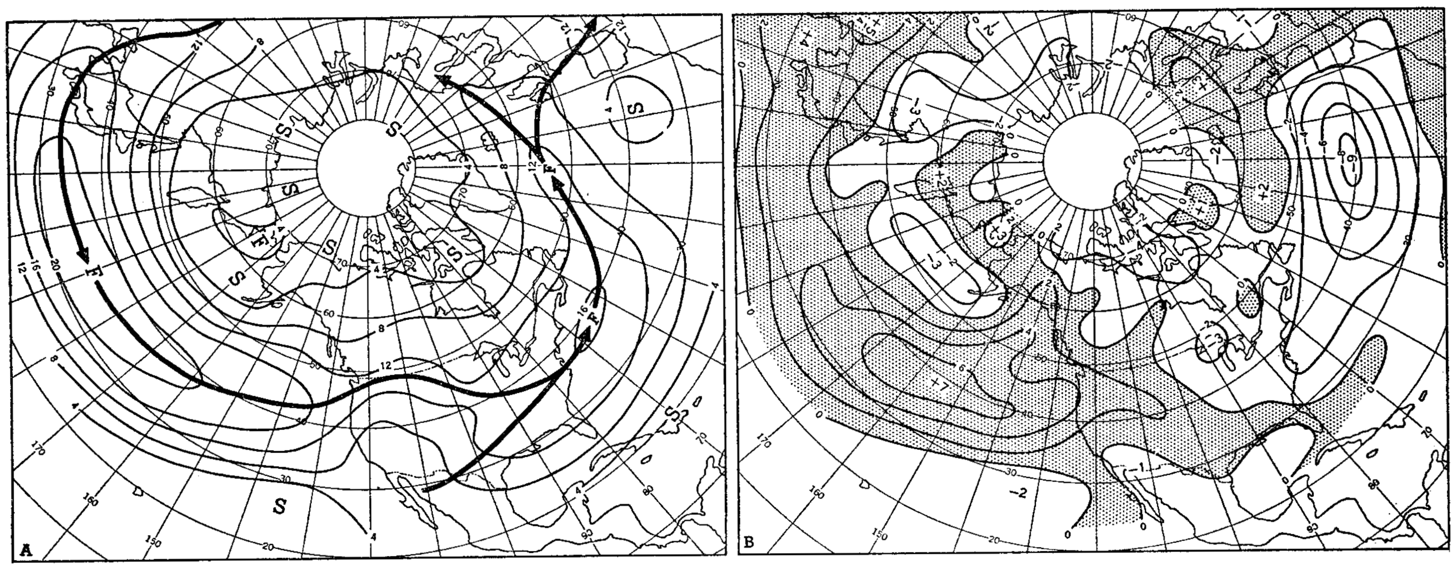



FIGURE 3.—Mean 700-mb. isotachs (a) and departure from normal wind speed (b) (both in meters per second) for winter of 1952–53 (Dec.–Feb.). Solid arrows indicate the average position of the jet stream, which was stronger than normal in the eastern Pacific and western United States, but weaker than normal in the western Atlantic and eastern United States.

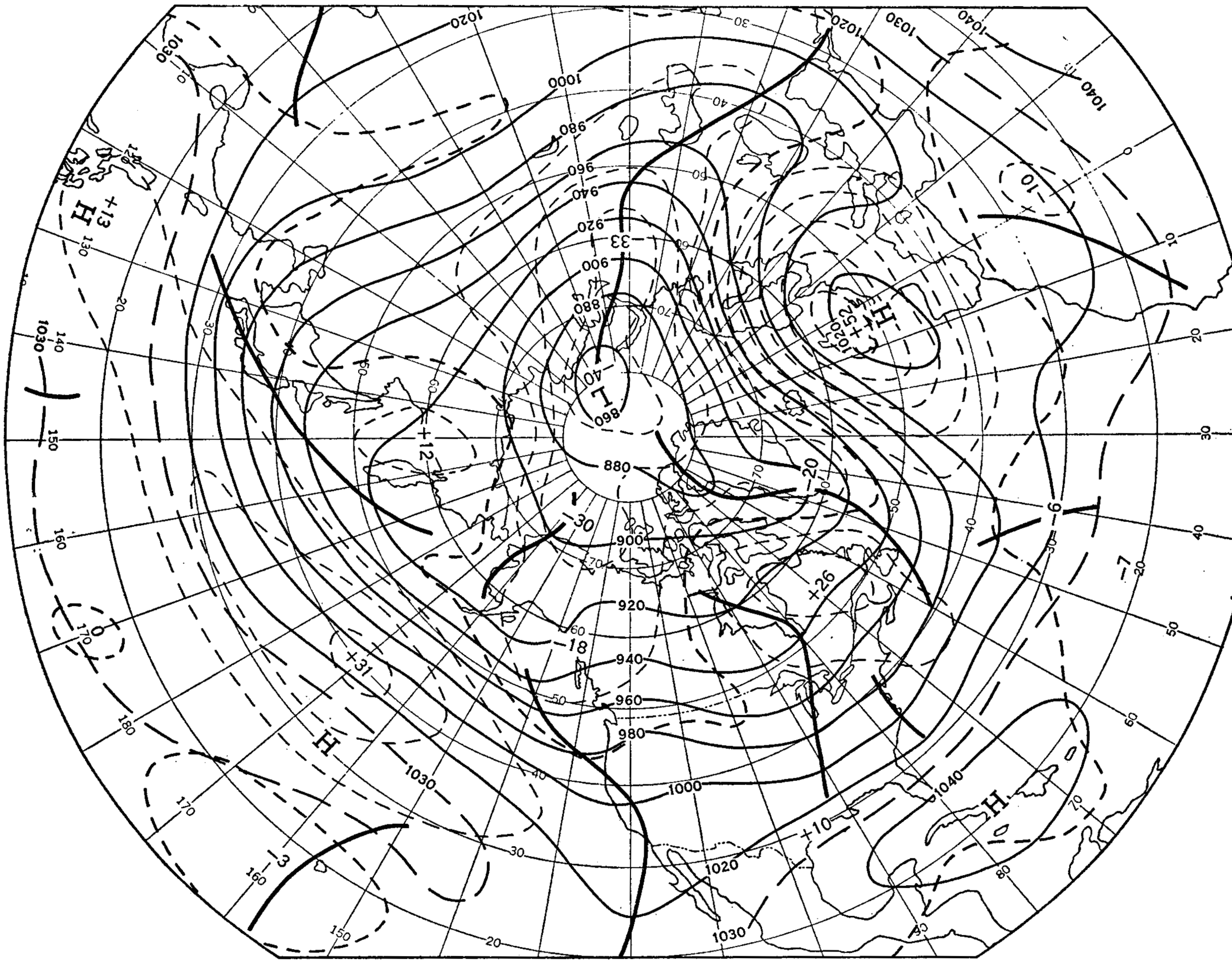


FIGURE 4.—Mean 700-mb. height contours and departures from normal (both in tens of feet) for February 28–March 29, 1953. Note continued anomalous flow of maritime air into Canada and the northern United States.

Alaska, and the Arctic Ocean to the north. This flow produced unusually warm weather throughout this region, the normal source region for cold polar air masses affecting the United States. Consequently, invasions of the United States by cold continental air from Alaska, Canada, and the Arctic were extremely weak, infrequent, and short-lived. Thus, the winter's mild regime may be attributed to the effect of unusual warmth at the polar source as well as the abnormal influx of maritime air from both the Pacific and the Atlantic Oceans.

## THE MONTH OF MARCH

The excessive warmth which had characterized the winter season continued to prevail during the month of March in most of the United States (Chart I-B). Continued mild weather was accompanied by persistence of the three circulation features to which the winter warmth may be attributed. In the first place, nearly all of Canada enjoyed southerly wind components, relative to normal, at both 700 mb. (fig. 4) and sea level (Chart XI inset). Secondly, the westerly jet stream in the Pacific continued to blow with exceptional vigor, not only at 700 mb., where wind speeds were as much as 17 m. p. h. greater than normal (fig. 5), but also at the 200-mb. level (fig. 6). The eastward extension of this jet stream produced mild southwesterly wind components, relative to normal, over most of the western United States at 700 mb. Finally, blocking continued to affect the Atlantic and eastern North America, where wind speeds in the westerly jet stream at middle latitudes were weaker than usual. As a result, anomalous flow from a southeasterly direction at both 700 mb. and sea level brought above normal temperatures to nearly all of the eastern United States. It is also noteworthy that few polar anticyclones from Canada were able to penetrate into the United States (fig. 7a and Chart IX), while above normal temperatures

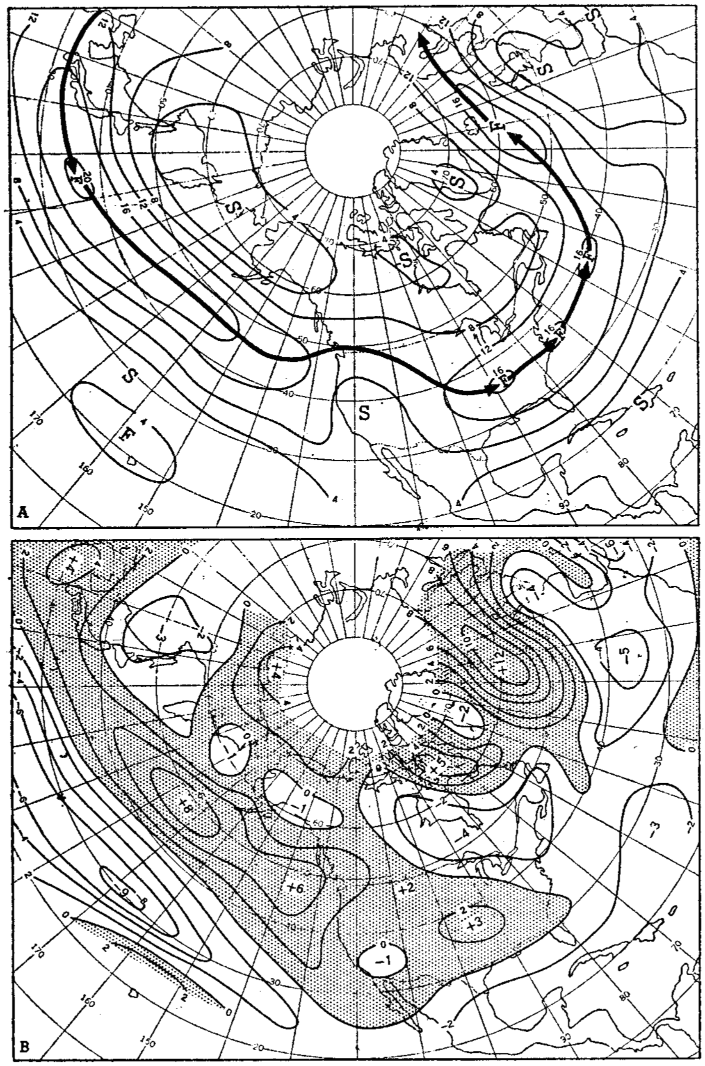


Figure 5.—Mean 700-mb. isotachs (a) and departure from normal wind speed (b) (both in meters per second) for February 28–March 29, 1953. Solid arrows indicate the average position of the jet stream, which continued stronger than normal in the eastern Pacific and western United States, but weaker than normal in the western Atlantic and eastern United States.

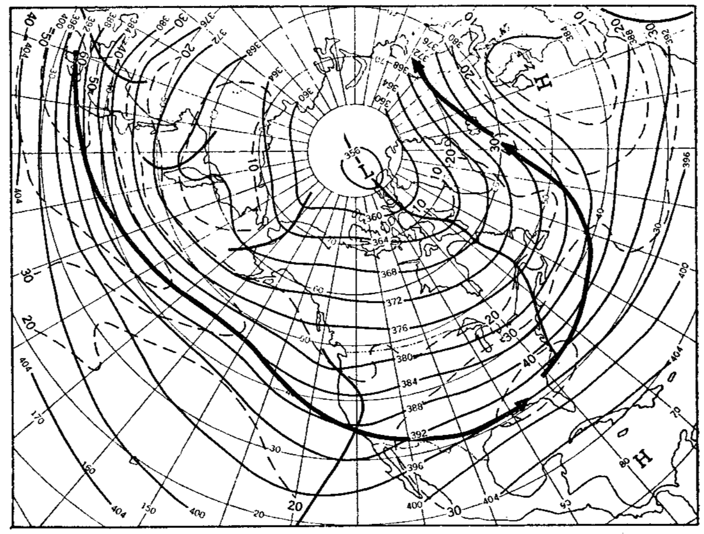


Figure 6.—Mean 200-mb. contours (in hundreds of feet) and isotachs (in meters per second) for February 28–March 29, 1953. Solid arrow indicates the average position of the jet stream which split into two branches around the blocking High over Britain. Note the well-developed trough along the West Coast, directly over the 700-mb. trough.

in most of the country were accompanied by above normal heights at the 700-mb. level (fig. 4). By the end of the month snow cover (Chart V-B) had melted throughout the nation except for mountainous areas, and all ports on the Great Lakes were ice free. Buffalo was completely open to navigation on March 2, the earliest in 100 years.

The only portion of the United States with an appreciable negative temperature anomaly during March was the West Coast area. Here monthly mean temperatures averaged as much as 2° below normal because of the dominance of cool Pacific air masses in stronger than normal northwesterly flow at sea level (Chart XI and inset). Aloft the area was dominated by a deep cold cyclonic circulation, as indicated by the isotherms in Charts XII to XV and by the fact that a contour trough was located along the West Coast at all levels from 700 to 200 mb. During the first week of March many parts of Oregon experienced their coldest weather since November 1952. On several nights during the month freezing temperatures damaged crops in portions of California and necessitated the artificial heating of orchards.

Precipitation during the month (Chart III) was generally heavy in the eastern half of the United States, except for the Gulf Coast, where dry anticyclonic conditions prevailed. More than twice the normal amount fell along the North Atlantic Coast and in portions of Missouri and the Dakotas. New York City had its wettest March in 83 years of record. Most of the moisture for this precipitation was carried from the Gulf of Mexico and the Atlantic by stronger than normal southeasterly flow at sea level (Chart XI and inset). At the 700-mb. level greater than normal cyclonic vorticity generally prevailed in the region of heavy precipitation. There was a tendency for this region to be split into an eastern and a western branch, with less precipitation in a band just west of the Appalachian Mountains from Ohio to Alabama. A corresponding split was evident in the cyclone tracks (fig. 7b and Chart X), with one principal track along the Atlantic Coast and the other from Colorado through Michigan. Many of these cyclones were blocked by the strong ridge in eastern Canada and forced to decelerate and recurve sharply to the north and northwest. During the last week of the month a storm of this sort caused 4 to 6 inches of rain along the entire New England coast and serious flood conditions developed in parts of Maine, New Hampshire, and New York.[2] Another such storm was responsible for tornadoes, hail, and high winds in parts of the Mississippi Valley on the 21st and 22d.

In the western half of the United States precipitation was generally subnormal. This area was dominated by

[2] For further details see adjoining article by Lennehan and Holzworth.

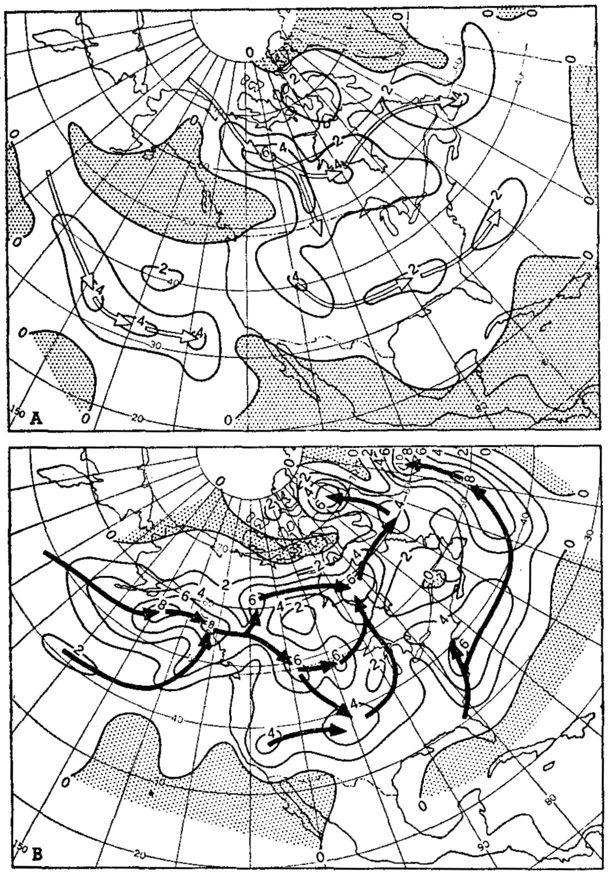


FIGURE 7.—Frequency of anticyclone passages (a) and cyclone passages (b) (within 5° squares at 45° N.) during March 1953. Well-defined anticyclone tracks are indicated by open arrows and cyclone tracks by solid arrows. Note lack of polar anticyclones in the United States, ill-defined cyclone track across North America, and lack of normal cyclonic activity in the St. Lawrence Valley. (All data derived from Charts IX and X.)

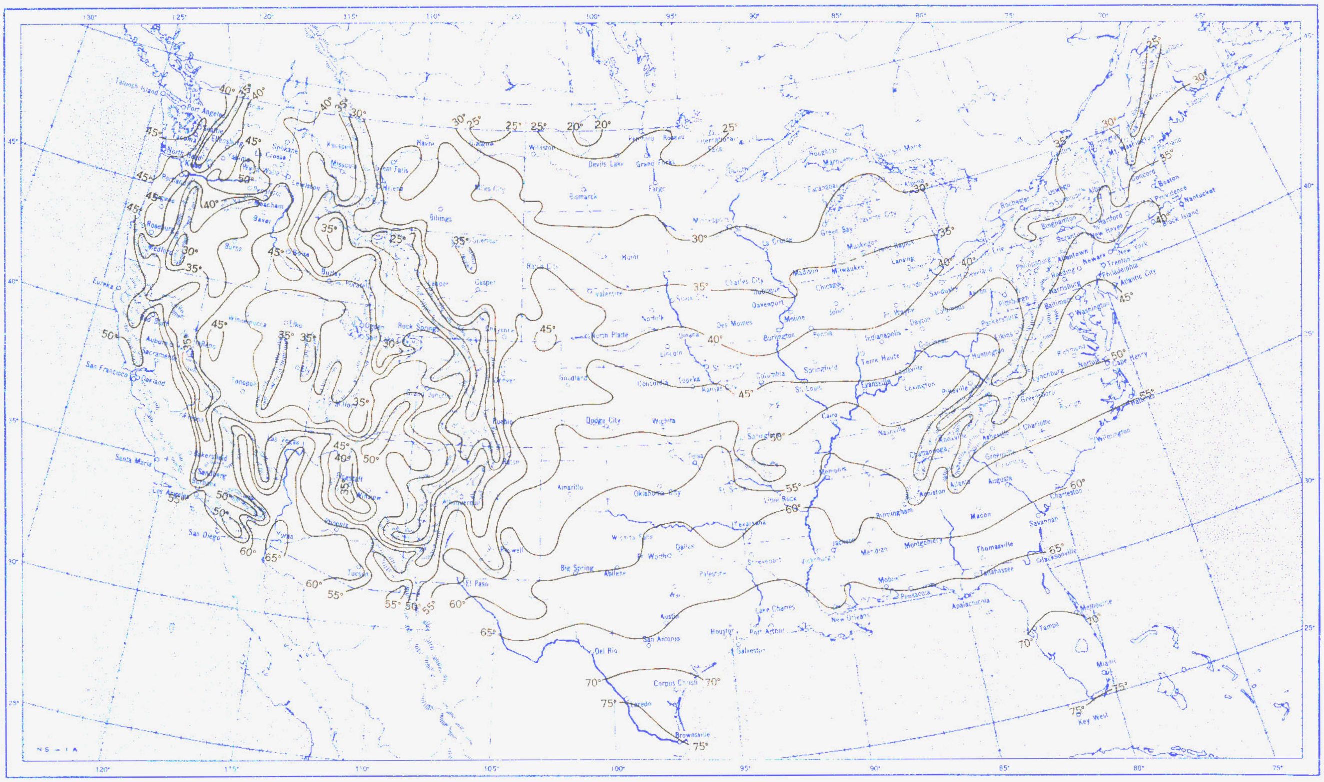
ridge conditions and above normal heights at 700 mb. together with dry northerly wind components, relative to normal, at sea level. Less than one-fourth of normal precipitation fell during the month in parts of California, Nevada, Wyoming, and Colorado. State-wide precipitation in Wyoming and Nevada averaged only 40 percent and 43 percent of normal, respectively. Strong winds and blowing dust aggravated the droughty situation in the western Great Plains. California received some relief from last month's severe drought [3] in northern sections, but precipitation continued subnormal in most of the State with the greatest deficiency in the south.

Perhaps the most notable feature of the hemispheric circulation (outside of North America) was the strong High centered over the British Isles, where 700-mb. heights averaged 520 ft. above normal for the month (fig. 4). This High extended with little horizontal displacement through all layers of the troposphere, from sea level, where pressures were 20 mb. above normal, to the 200-mb. level, where a closed circulation was still in existence (fig. 6). This was a classical blocking High of the type recently described by Rex [4] since it was accompanied by a well-marked split or difluence in the westerly jet stream some distance upstream. The northerly branch of the jet stream reached a peak mean monthly speed of 67 m. p. h. at 200 mb. (fig. 6) just south of Icleand, where 700-mb. wind speeds were 27 m. p. h. greater than normal (fig. 5b); but the southern branch was incompletely delineated because of lack of data at low latitudes. The occurrence of this block during the month of March is also a characteristic feature since Atlantic blocking activity occurs more frequently during March than any other month of the year except May [4]. A fortunate result of the predominance of anticyclonic conditions over western Europe was the fact that prevailingly fair weather permitted repair of much of the damage inflicted by severe storminess earlier in the year [1]. In parts of eastern and southern England less than 10 percent of normal precipitation was recorded during March, and new records for dryness were established.

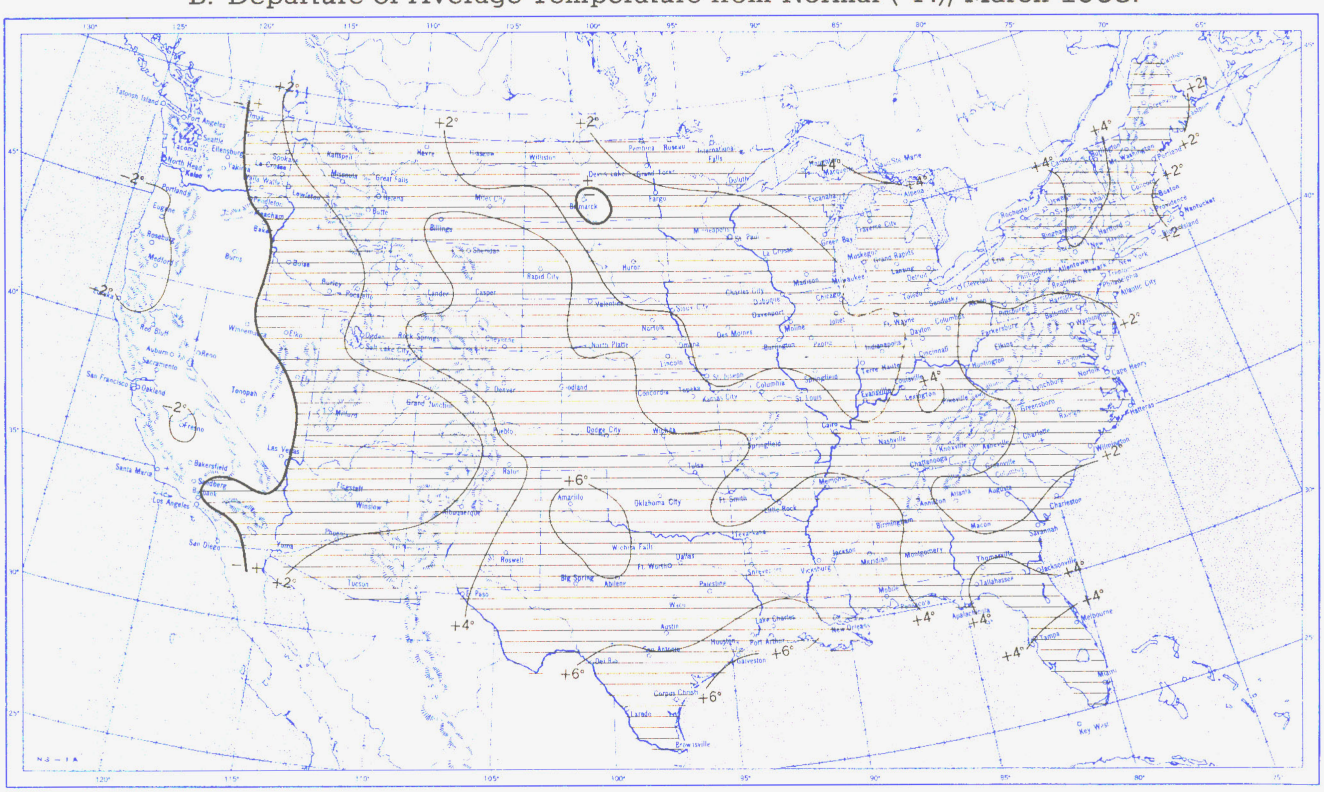
## REFERENCES


1. K. E. Smith, "The Weather and Circulation of January 1953," *Monthly Weather Review*, vol. 81, No. 1, Jan. 1953, pp. 16–19.
2. H. F. Hawkins, Jr., "The Weather and Circulation of December 1952," *Monthly Weather Review*, vol. 80, No. 12, Dec. 1952, pp. 246–249.
3. K. E. Smith, "The Weather and Circulation of February 1953," *Monthly Weather Review*, vol. 81, No. 2, Feb. 1953, pp. 43–46.
4. D. F. Rex, "Blocking Action in the Middle Troposphere and Its Effect upon Regional Climate," *Tellus*, vol. 2, Nos. 3 and 4, Aug. and Nov. 1950, pp. 196–211 and 275–301.

## Chart I. A. Average Temperature (°F.) at Surface, March 1953.



## B. Departure of Average Temperature from Normal (°F.), March 1953.

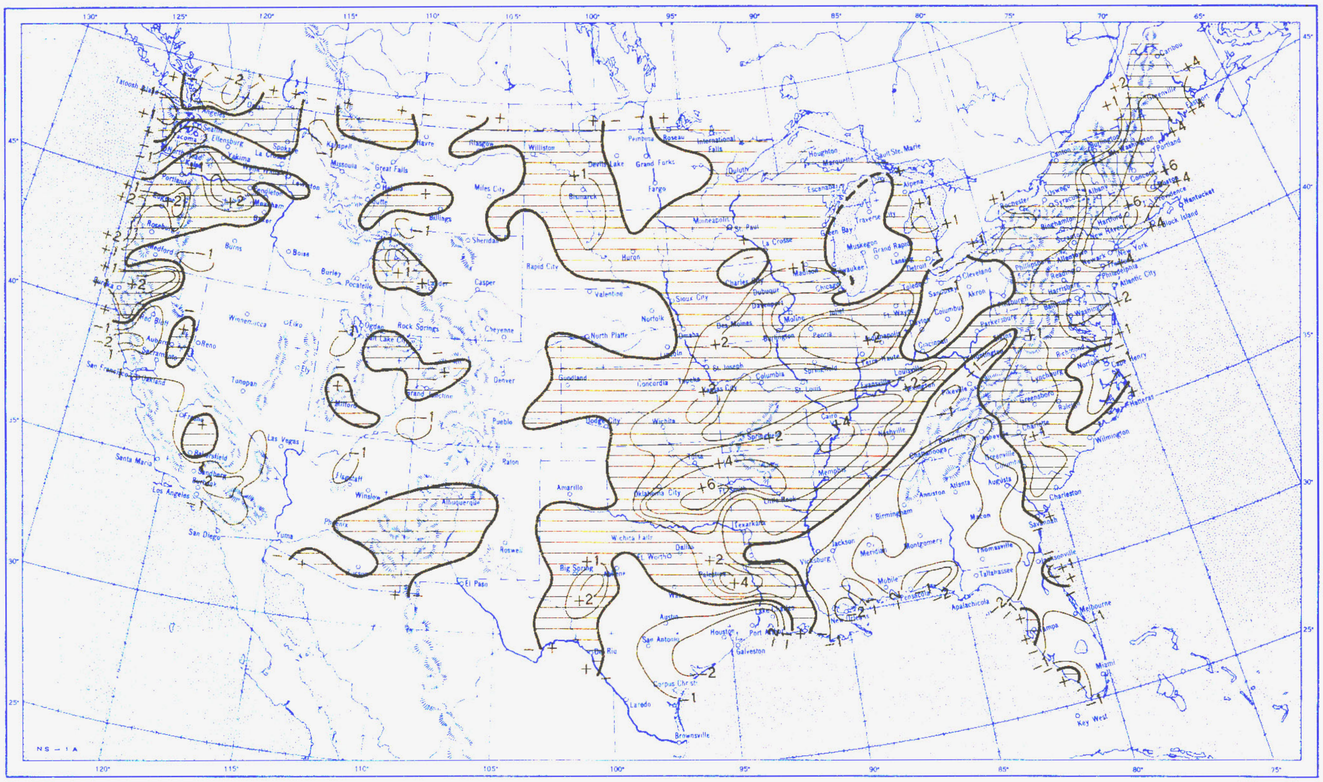


A. Based on reports from 800 Weather Bureau and cooperative stations. The monthly average is half the sum of the monthly average maximum and monthly average minimum, which are the average of the daily maxima and daily minima, respectively.
B. Normal average monthly temperatures are computed for Weather Bureau stations having at least 10 years of record.

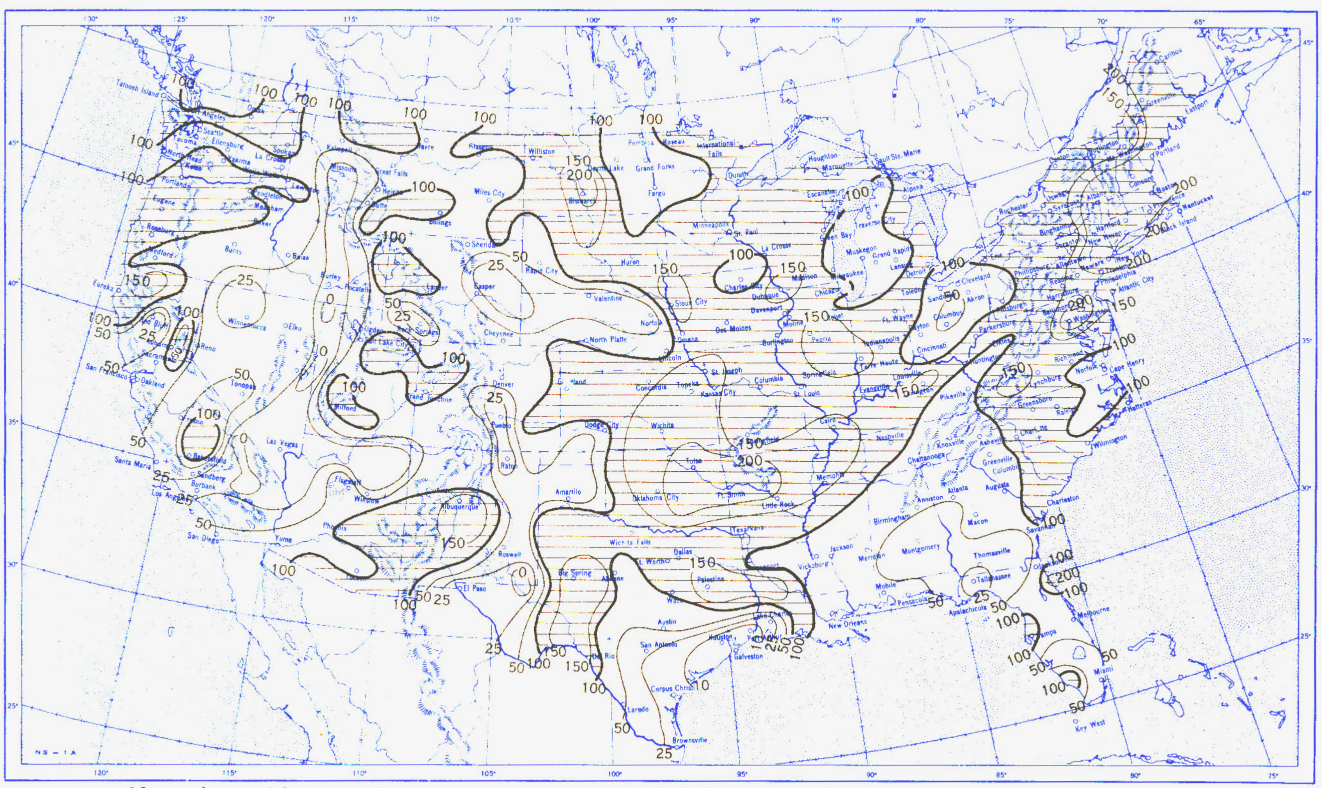
Chart II. Total Precipitation (Inches), March 1953.


Based on daily precipitation records at 800 Weather Bureau and cooperative stations.

## Chart III. A. Departure of Precipitation from Normal (Inches), March 1953.

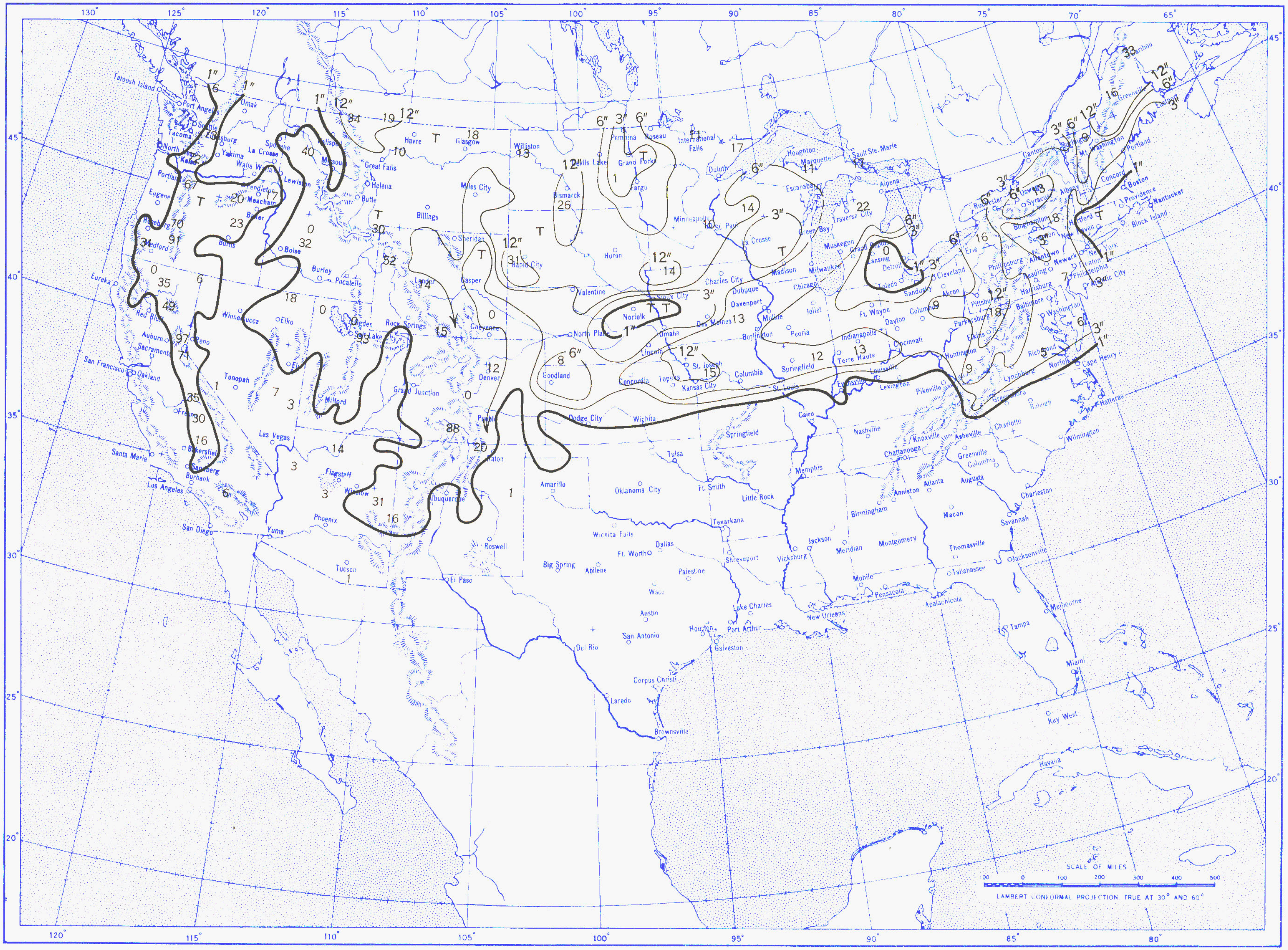


## B. Percentage of Normal Precipitation, March 1953.



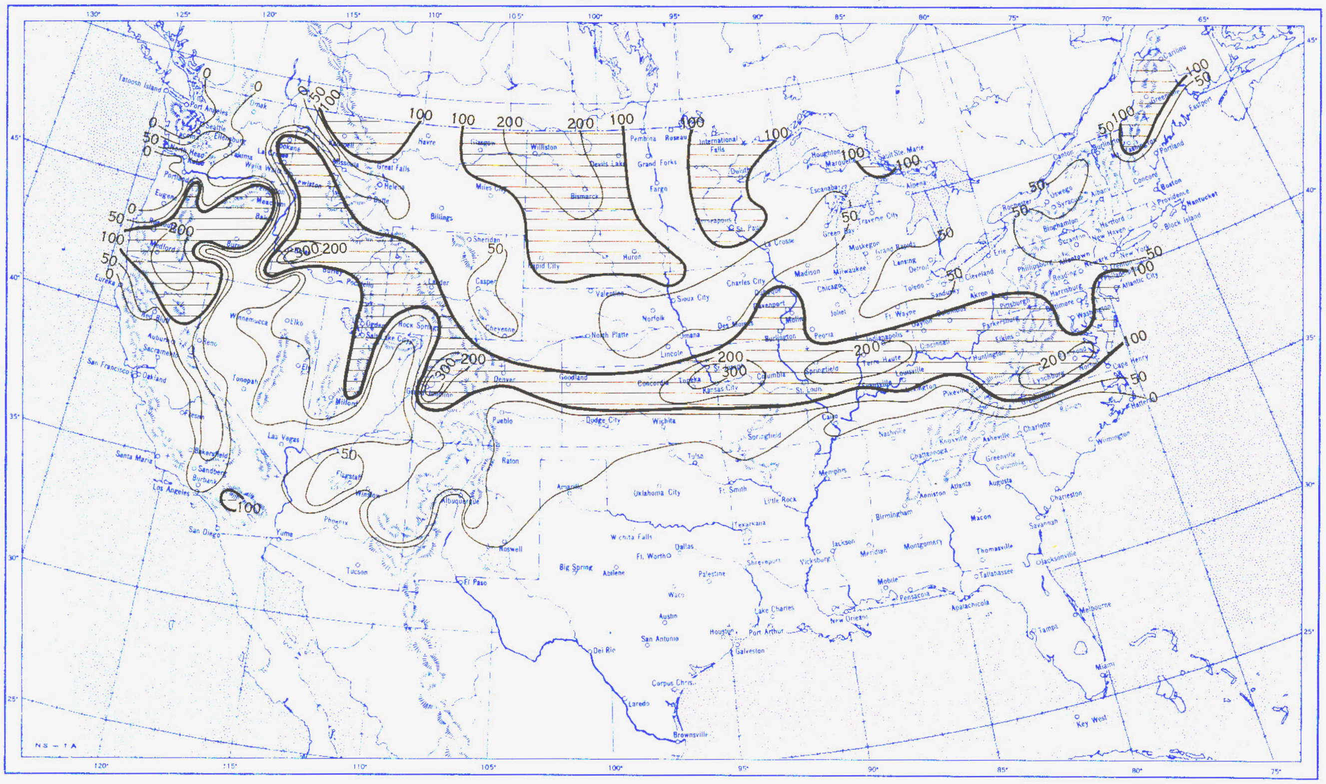
Normal monthly precipitation amounts are computed for stations having at least 10 years of record.

# Chart IV. Total Snowfall (Inches), March 1953.

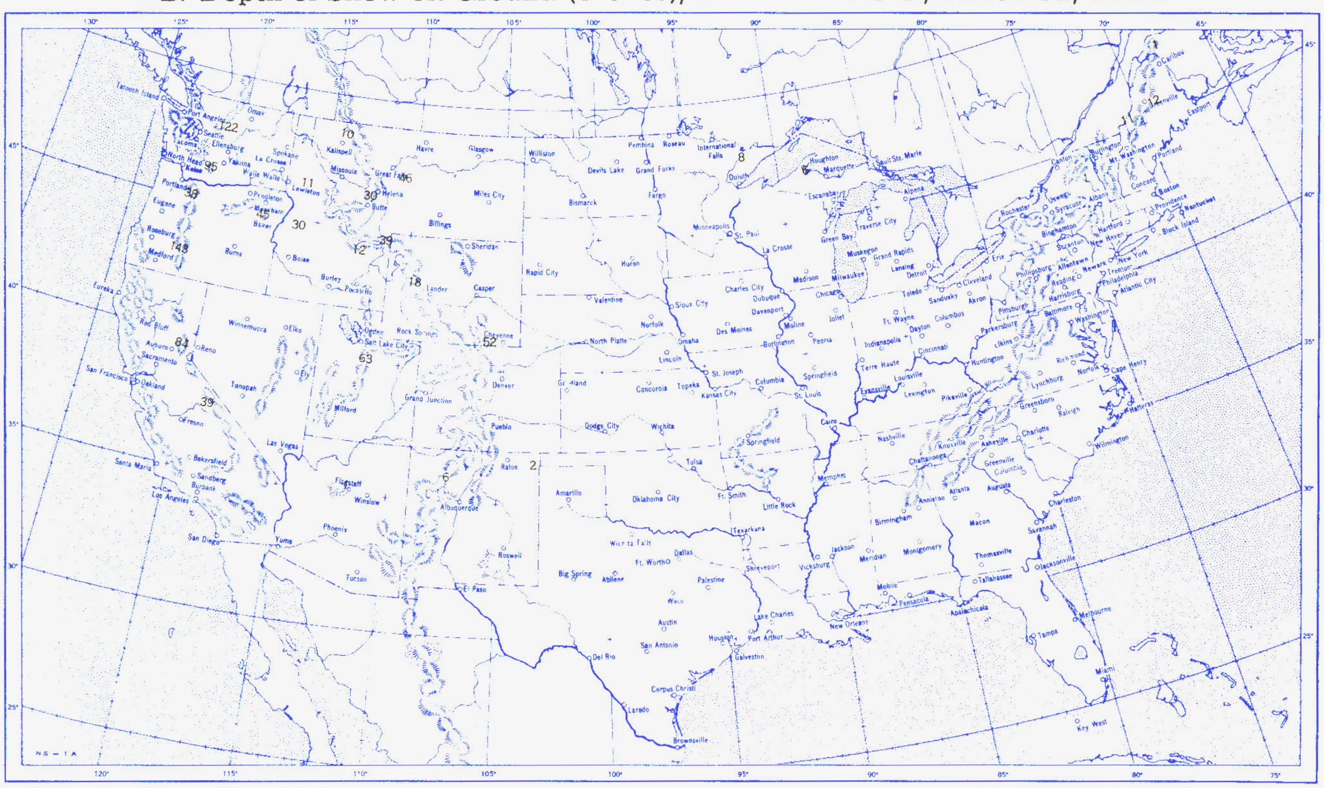


This is the total of unmelted snowfall recorded during the month at Weather Bureau and cooperative stations. This chart and Chart V are published only for the months of November through April although of course there is some snow at higher elevations, particularly in the far West, earlier and later in the year.

## Chart V. A. Percentage of Normal Snowfall, March 1953.

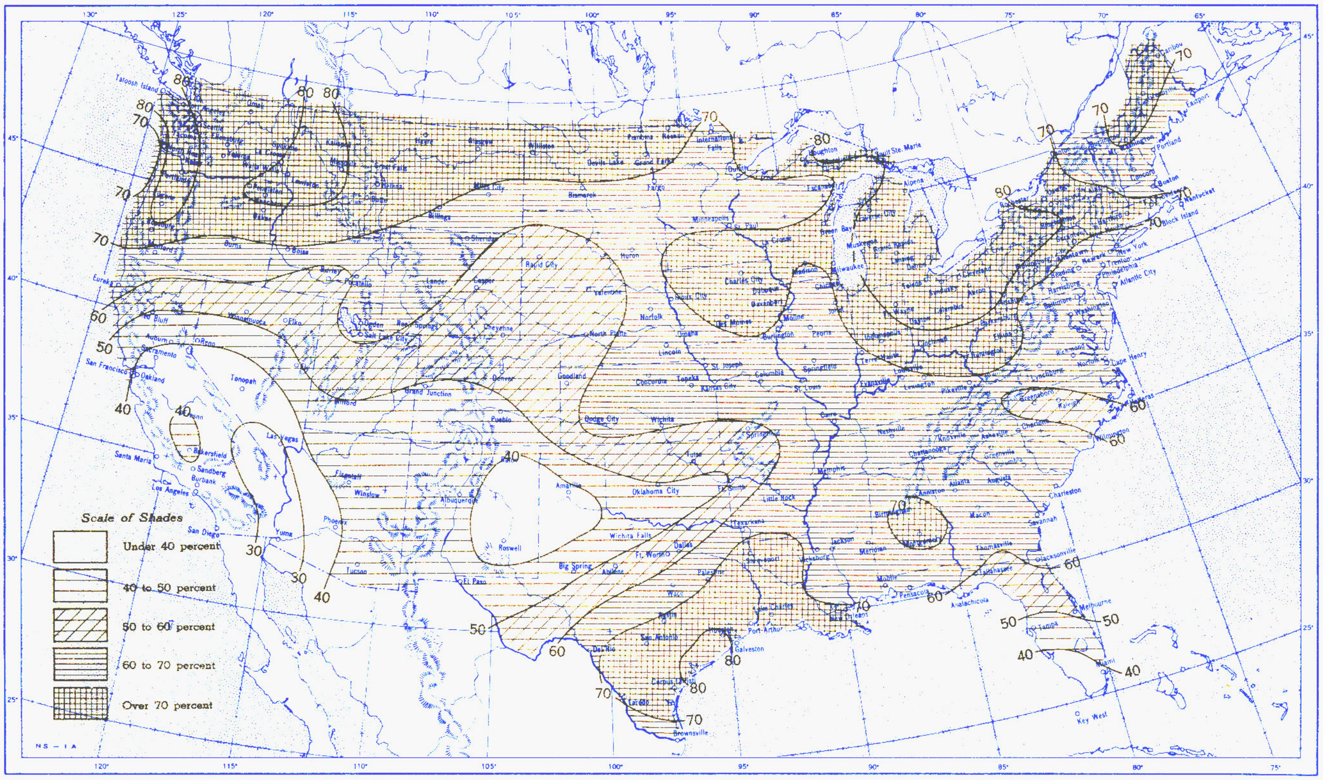


## B. Depth of Snow on Ground (Inches), 7:30 a. m. E. S. T., March 31, 1953.

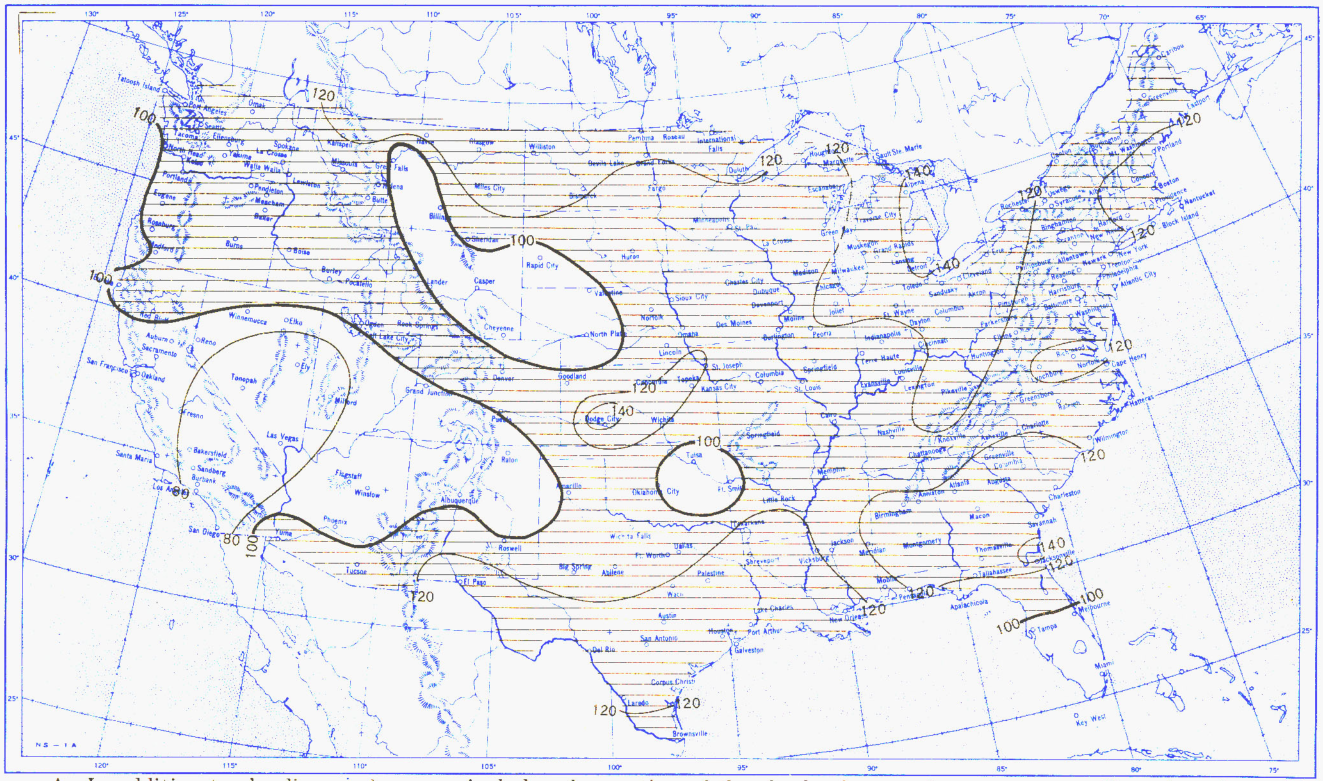


A. Amount of normal monthly snowfall is computed for Weather Bureau stations having at least 10 years of record. B. Shows depth currently on ground at 7:30 a. m. E. S. T., of the Tuesday nearest the end of the month. It is based on reports from Weather Bureau and cooperative stations. Dashed line shows greatest southern extent of snowcover during month.

## Chart VI. A. Percentage of Sky Cover Between Sunrise and Sunset, March 1953.

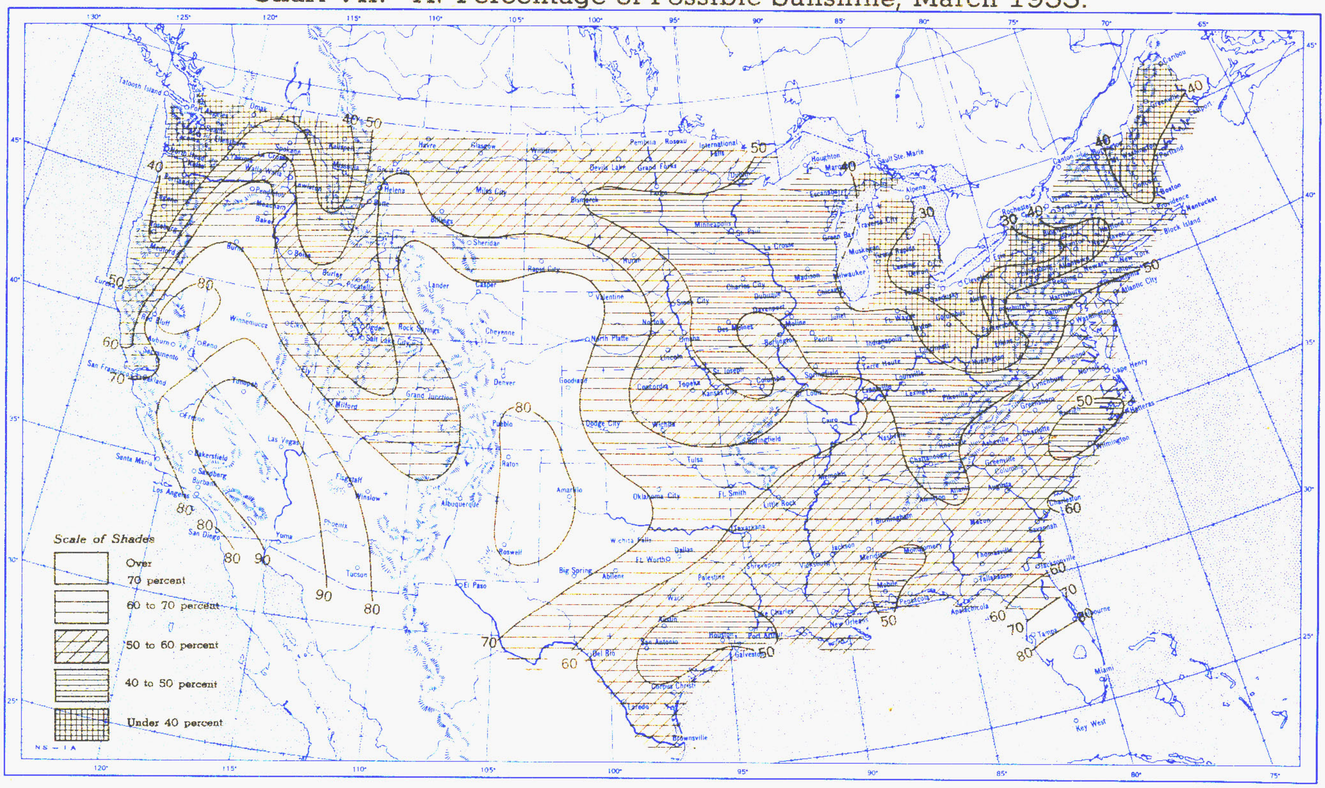



## B. Percentage of Normal Sky Cover Between Sunrise and Sunset, March 1953.

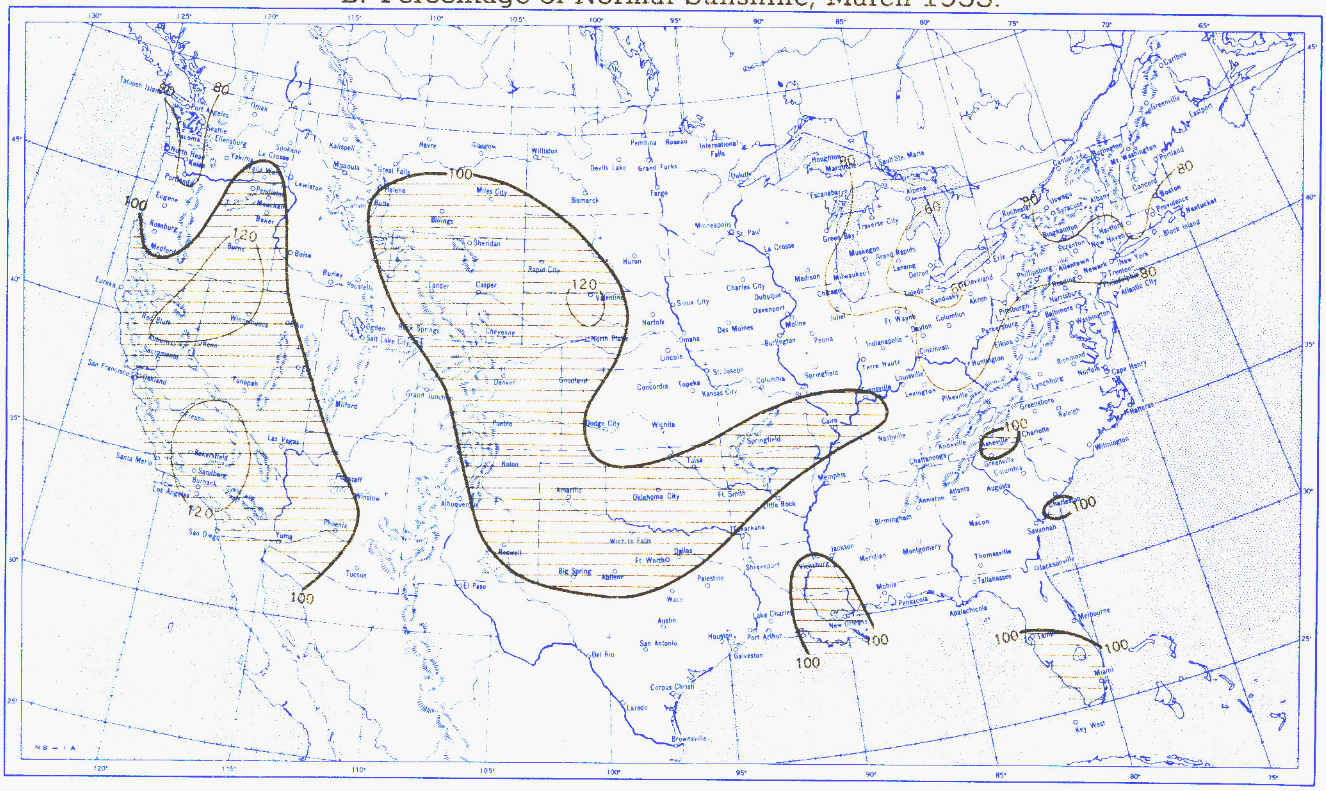


A. In addition to cloudiness, sky cover includes obscuration of the sky by fog, smoke, snow, etc. Chart based on visual observations made hourly at Weather Bureau stations and averaged over the month. B. Computations of normal amount of sky cover are made for stations having at least 10 years of record.

## Chart VII. A. Percentage of Possible Sunshine, March 1953.




## B. Percentage of Normal Sunshine, March 1953.



A. Computed from total number of hours of observed sunshine in relation to total number of possible hours of sunshine during month. B. Normals are computed for stations having at least 10 years of record.

Chart VIII. Average Daily Values of Solar Radiation, Direct + Diffuse, March 1953. Inset: Percentage of Normal Average Daily Solar Radiation, March 1953.

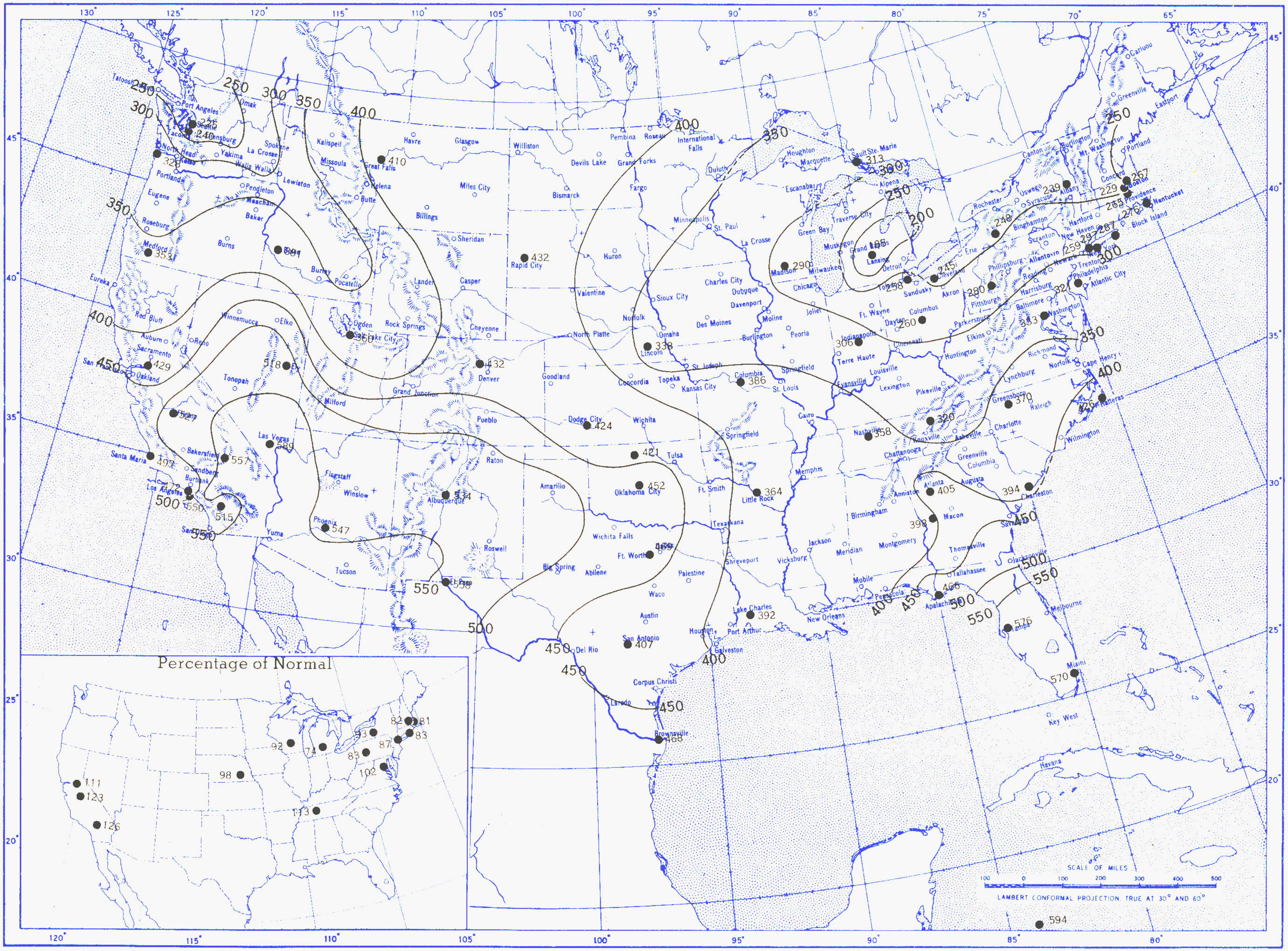
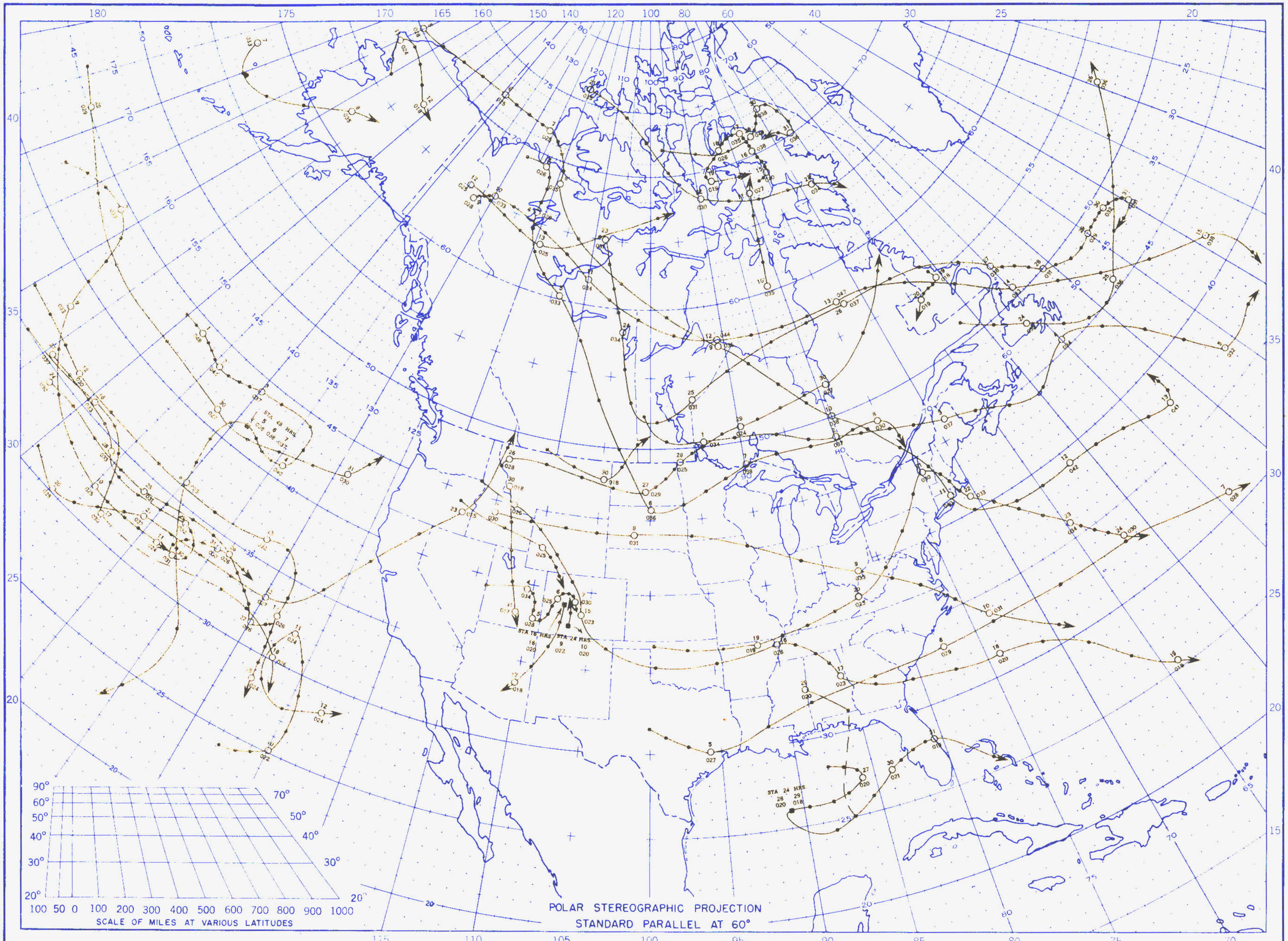


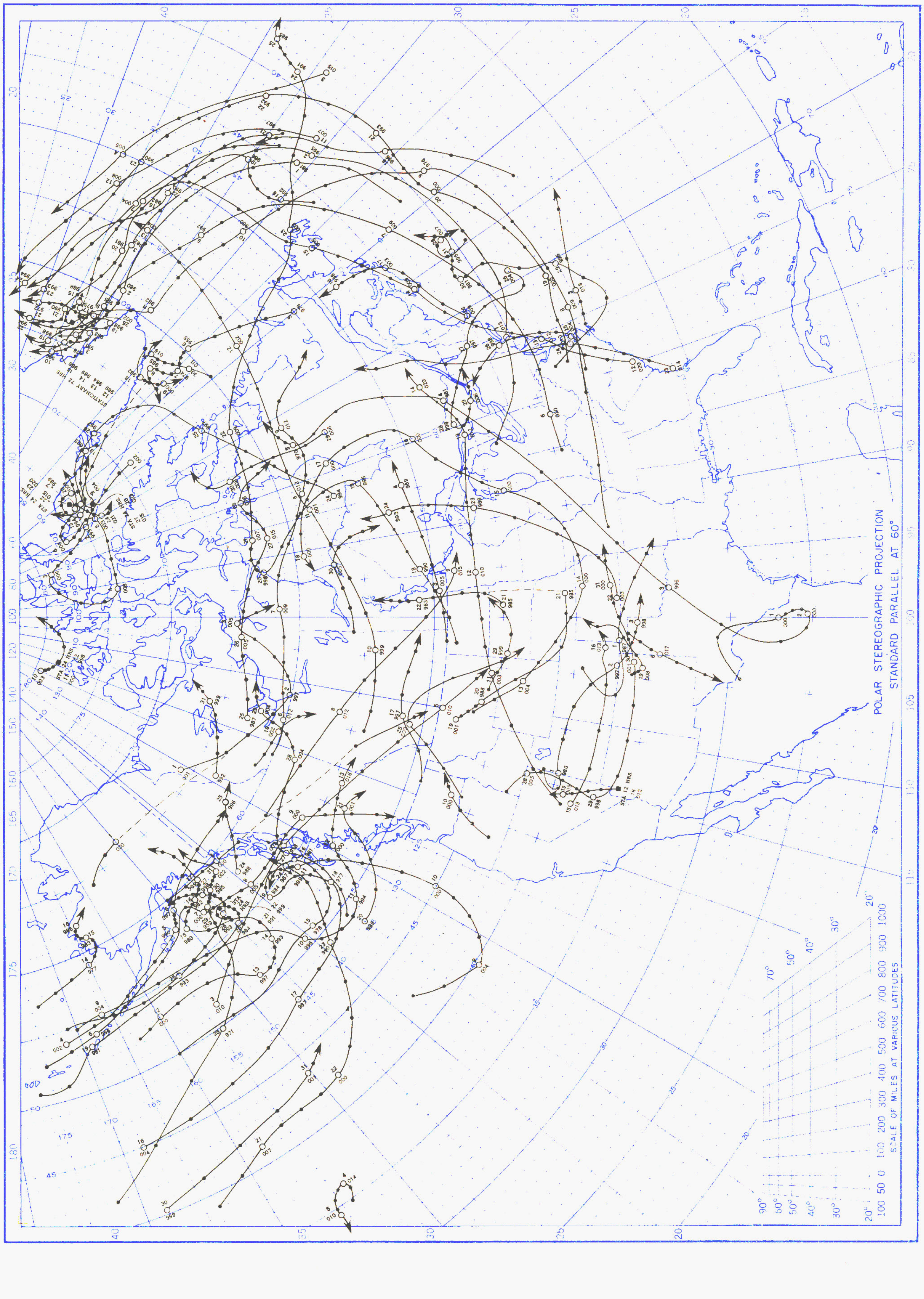

Chart shows mean daily solar radiation, direct + diffuse, received on a horizontal surface in langleys (1 langley = 1 gm. cal. cm.$^{-2}$). Basic data for isolines are shown on chart. Further estimates are obtained from supplementary data for which limits of accuracy are wider than for those data shown. Normals are computed for stations having at least 9 years of record.

Chart IX. Tracks of Centers of Anticyclones at Sea Level, March 1953.



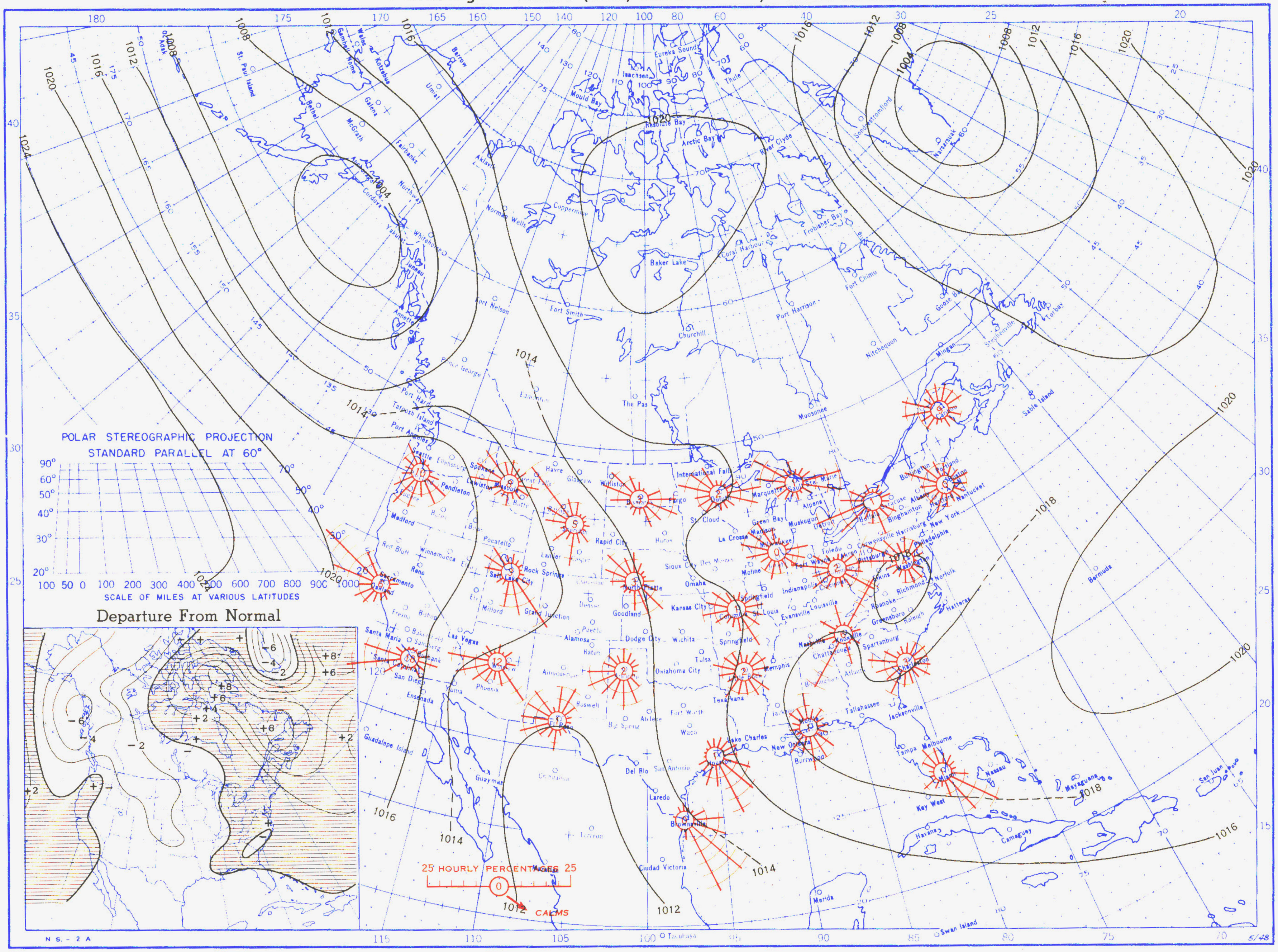

Circle indicates position of center at 7:30 a. m. E. S. T. Figure above circle indicates date, figure below, pressure to nearest millibar. Dots indicate intervening 6-hourly positions. Squares indicate position of stationary center for period shown. Dashed line in track indicates reformation at new position. Only those centers which could be identified for 24 hours or more are included.

## Chart X. Tracks of Centers of Cyclones at Sea Level, March 1953.



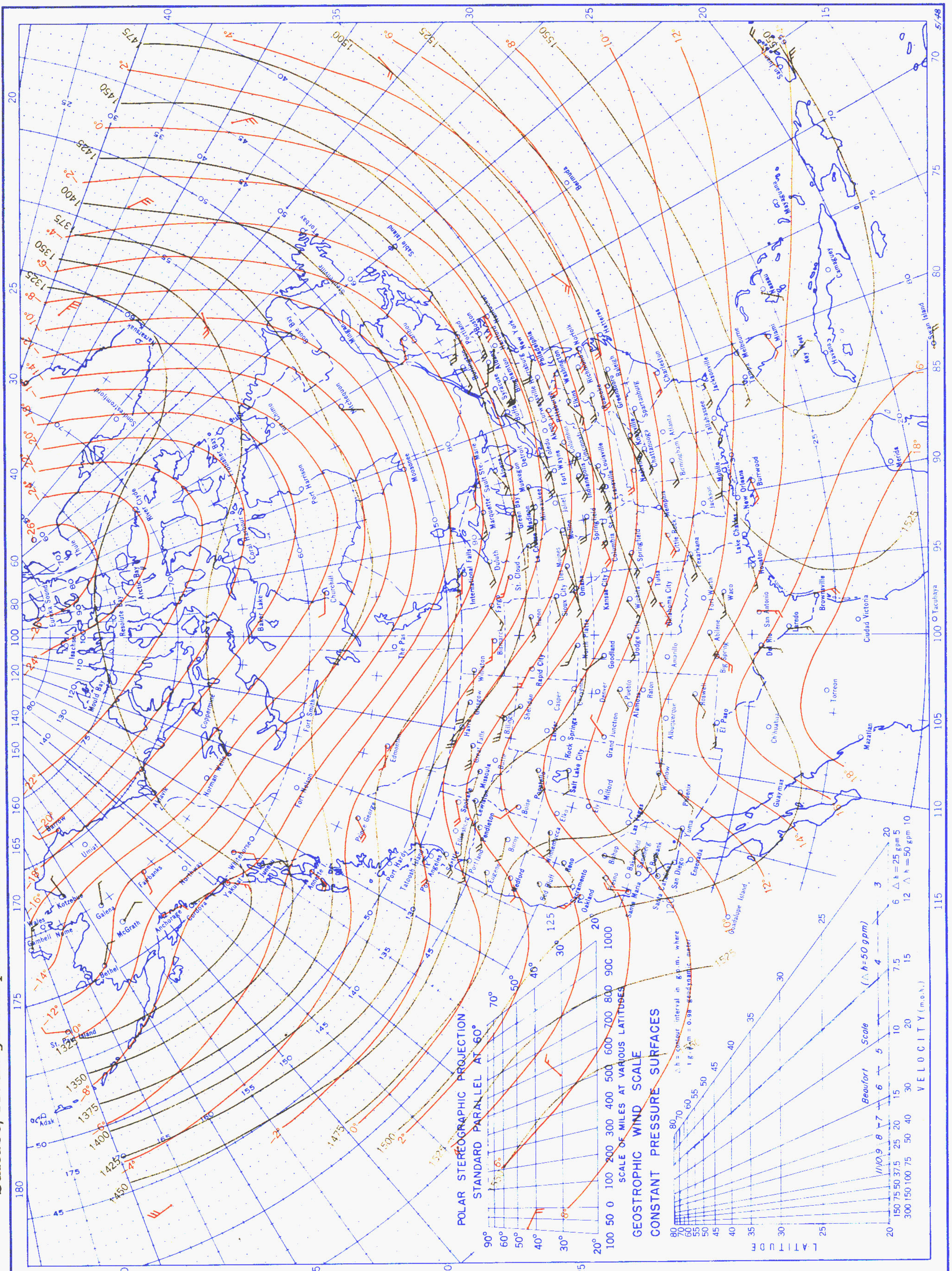

Circle indicates position of center at 7:30 a. m. E. S. T. See Chart IX for explanation of symbols.

Chart XI. Average Sea Level Pressure (mb.) and Surface Windroses, March 1953. Inset: Departure of Average Pressure (mb.) from Normal, March 1953.



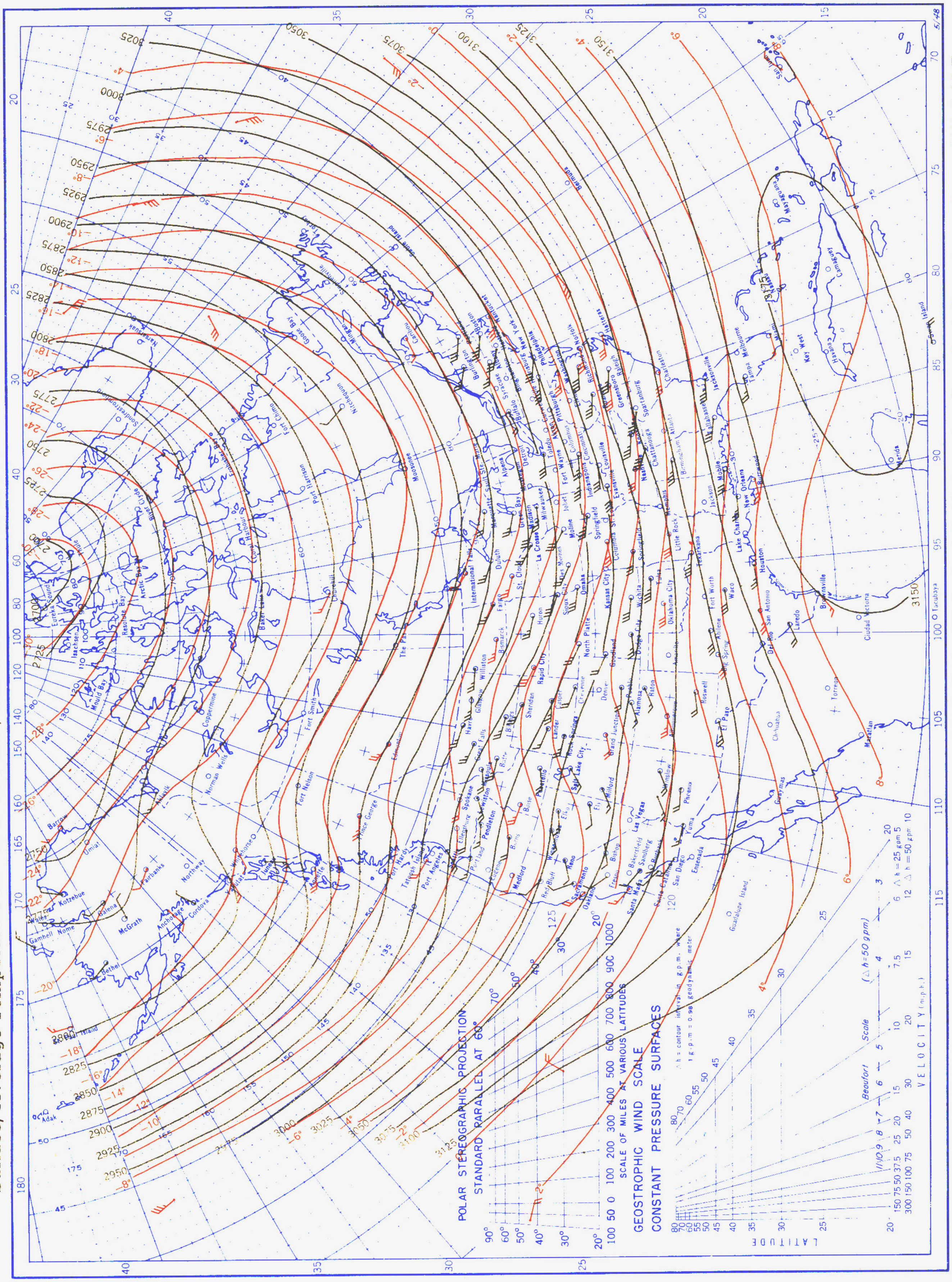

Average sea level pressures are obtained from the averages of the 7:30 a. m. and 7:30 p. m. E. S. T. readings. Windroses show percentage of time wind blew from 16 compass points or was calm during the month. Pressure normals are computed for stations having at least 10 years of record and for 10° intersections in a diamond grid based on readings from the Historical Weather Maps (1899-1939) for the 20 years of most complete data coverage prior to 1940.

Chart XII. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 850-mb. Pressure Surface, Average Temperature in °C. at 850 mb., and Resultant Winds at 1500 Meters (m.s.l.), March 1953.



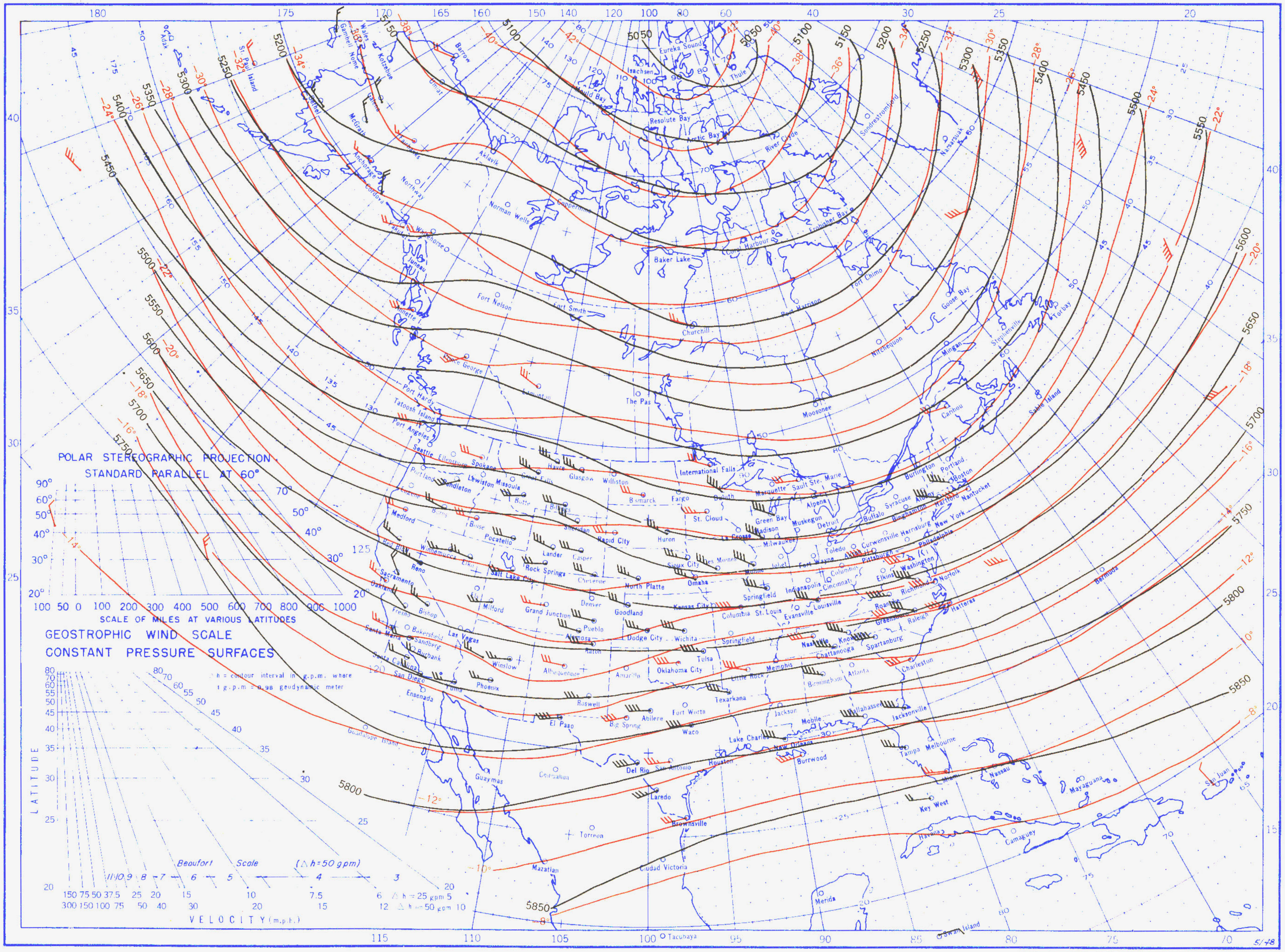

Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins taken at 0300 G. M. T.

Chart XIII. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 700-mb. Pressure Surface, Average Temperature in °C. at 700 mb., and Resultant Winds at 3000 Meters (m.s.l.), March 1953.



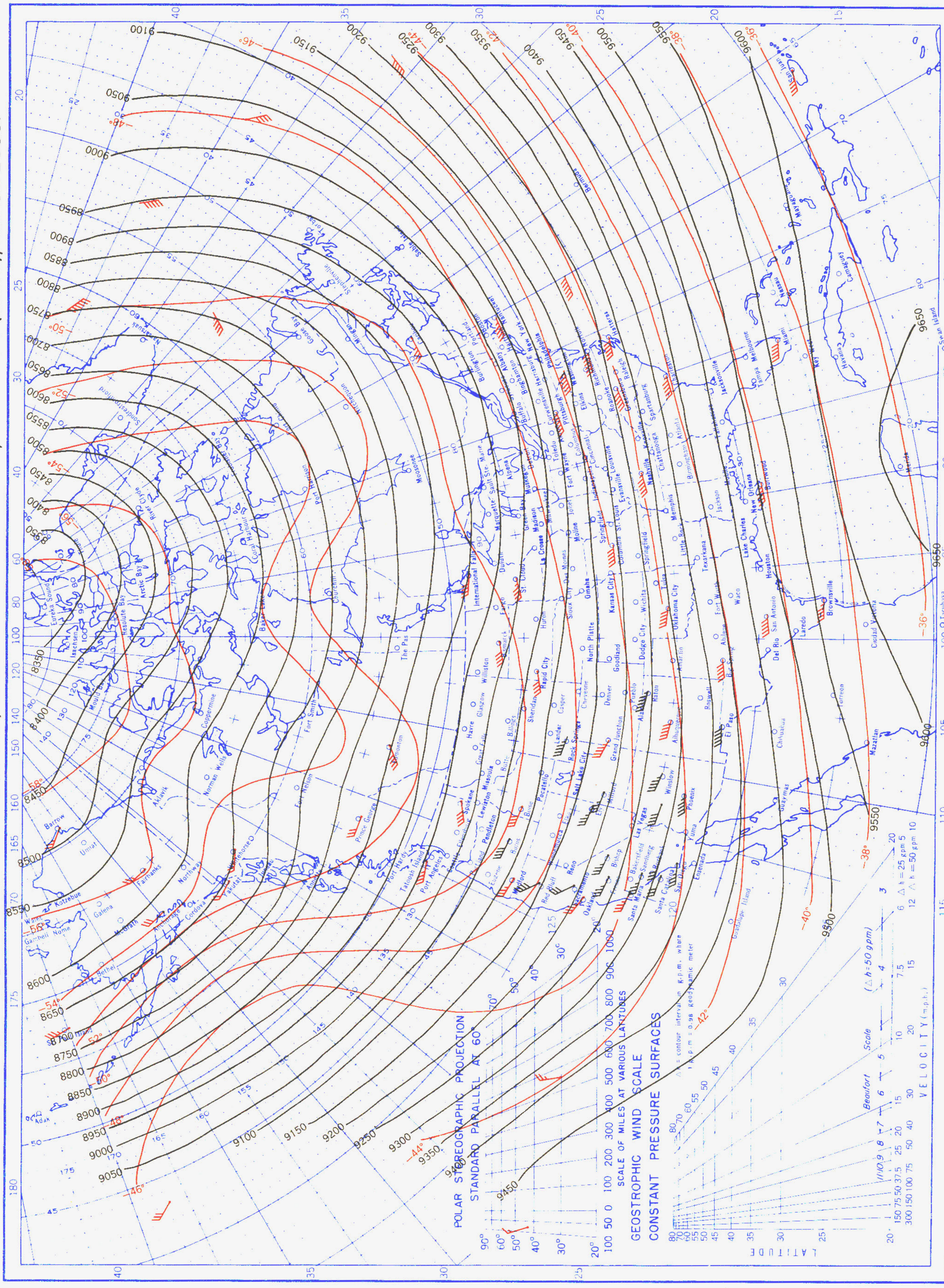

Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins taken at 0300 G. M. T.

Chart XIV. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 500-mb. Pressure Surface, Average Temperature in °C. at 500 mb., and Resultant Winds at 5000 Meters (m.s.l.), March 1953.




Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins at 0300 G. M. T.

Chart XV. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 300-mb. Pressure Surface, Average Temperature in °C. at 300 mb., and Resultant Winds at 10,000 Meters (m.s.l.), March 1953.




Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins at 0300 G. M. T.